

# OPERATING MANUAL C €

## Laminar flow clean-air unit

with vertical air conduction to create a DIN EN ISO 14644  
class 5 clean-room zone for covering a TECAN construction

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**Order no.:** 4600296382 dated July 7<sup>th</sup> 2009

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**Type:** FFM 05.19

**Serial no.:** 927009

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**Customer:** Tecan Schweiz AG  
Seestraße 103  
C-8708 Männedorf

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**Manufacturer:** BDK  
Luft- und Reinraumtechnik GmbH  
Pfullinger Straße 57  
D-72820 Sonnenbühl-Genkingen  
Phone: +49 (0) 71 28 / 92 67-0  
Fax: +49 (0) 71 28 / 92 67-22  
Web: [www.bdk-online.de](http://www.bdk-online.de)  
E-mail: [bdk-s@t-online.de](mailto:bdk-s@t-online.de)

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**APPENDIX A - EC Declaration of Conformity**

**APPENDIX B - Protocols / certificates**

**APPENDIX C - Drawings**

**APPENDIX D - Circuit diagram**

**APPENDIX E - Spare parts**

**APPENDIX F - Data sheets**

**APPENDIX G - Equipment manual**

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## **1. GENERAL NOTES**

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Please adhere to the instructions in our operating instructions to assure smooth and reliable operation of the laminar flow clean-air unit.

If you have questions to which you cannot find the answer in the operating instructions, please contact our office or one of our authorized representatives.

For quick and efficient help, please indicate the Model and Model Number located on the ID Plate.

---

### **1.1 Structure of the manual**

---

This manual contains data to the intended use of the clean-air unit, a description of the clean air unit, safety references, data to transport, mounting, installation and tests, to operation, repair, cleaning and maintenance, technical data as well as references to disposal.

The following documents are in the appendix of the manual:

- EC conformity declaration or declaration of incorporation
- Confirmation according BGV A3 §5 paragraph 4 of the rule for prevention of accidents "electrical systems and operational funds" (VBG 4)
- Layout drawing
- Electrical documentation with circuit diagram and parameters
- Parts list
- Data sheets
- Equipment manual

---

### **1.2 Applicable Documents**

---

Part of the documentation is the switchgear cabinet documentation. It consists of circuit diagram and data sheets and/or operating instructions of electrical components.

The record of qualification measurement should be available for the start-up.

---

### **1.3 Legend**

---

make attentive to remaining hazards which cannot be avoided while handling the clean-air unit. These remaining hazards refer to

- the product
- the persons
- the environment
- the clean-air unit

The following symbols are used in this manual:

**Warning Symbol**

This symbol points out that hazards for lives and health of persons exist - also hazards for machine, things or environment are possible.

If these references are not considered, it could lead to heavy - and also deadly - injuries.

**Safety Symbol**

This symbol points out that hazards for machine, things or environment exist - there is no risk for lives and health of persons.

If these references are not considered, the clean-air unit could be damaged, there may develop moreover damages and environmental damage.

**Directive Sign**

Instructions with this sign must be strictly adhered to.

**Additional Note**

Notes with this symbol indicate additional information, which can help you to use the machine optimally.

This symbol does not mark safety references.



Please note also that a safety symbol never can replace the text of a safety reference - the text of a safety reference therefore is always to be read completely.

---

**1.4 Meaning of this manual**

---

This manual belongs to the clean-air unit. It must be kept over the entire life span of the product and it must be maintained (i.e. updated if necessary).

The manual must be passed on to each following owner or user of the clean-air unit.

---

## 2. PROPER USE

---

The clean-air unit was built according to:

The status of latest technology and most currently recognized safety and technological guidelines. However, the operation can result in physical threats to the user and even in the user's or a third party's death. It can influence the system and other items as well.

- The system is intended for operations stated in the order confirmation only. Any other use, exceeding over and above what is indicated, unless agreed to in the contract, is considered improper. The manufacturer is not liable for any resulting damages. The user company carries the sole risk.
- The laminar flow clean-air unit does not protect from gas or steam.
- Handling of gases or agents producing flammable steam in connection with air or causing an explosive atmosphere is prohibited.

In addition to the operating instructions and regulations to prevent accidents in the country of use, the recognized technological regulations must be adhered to (safety and proper operation in accordance with UVV, VBG, VDE etc.).



Proper use includes adherence to procedures described in these operating instructions for installation, operation and maintenance.



Observe safety notes in chapter 4!

Any other use of this clean-air unit can be hazardous and is prohibited!

---

### **3. PERFORMANCE AND EQUIPMENT**

---

- **Model design FFM 05.19**  
The clean-air unit is produced to cover a TECAN construction. It is made of galvanized steel sheets and designed to be mounted on a machine frame at site.
- **Filter monitoring**  
The filters (HEPA-filters and pre-filters) are monitored via pressure switches.
- **Air speed**  
Adjustment of air speed is to be done with a potentiometer.
- **Non-glare workspace illumination above the workspace**
- **UV light, locked to white light, release by external signal on 2-pole plug**
- **3-pole plug PTC**
- **2-pole signal plug**



---

## **4. EQUIPMENT DESCRIPTION**

---

The laminar flow clean-air unit serves the protection of sensitive products from particulate and microbial contamination. The laminar flow clean-air unit primarily serves as protection for the product, not a person.

The clean-air unit was designed in accordance with the requirements of Purity Class 5 according to DIN EN ISO 14644-1, Purity Class 5 according to VDI 2083, Class 100 pursuant with former US Federal Standard 209e.

---

### **4.1 Function principle**

---

The clean-air unit is a system with largely low turbulence (laminar) displacement pressure in the work room.

The air flowing through the work room is sucked from the surrounding area through pre-filters and then cleaned through high-efficiency submicron particulate air filters. The clean-air flows evenly through the entire work area with little turbulence at a defined air speed (see chapter "Technical specifications").

Particles developing in the work area or freed particles are continuously disposed off through the laminar flow. The generated excess pressure warrants that particles from the surrounding area cannot penetrate the work area.

---

### **4.2 Regulation of air speed**

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The system is driven with a defined air speed (see chapter "Technical specifications").

Because of decreasing air speed with increasing filter saturation, the ventilators have to be adjusted with the potentiometer (see chapter "Operation").

---

## 5. SAFETY NOTES

---

### 5.1 Safety instructions in this manual

---



Caution! Mortal danger! High electrical tension!

This symbol points out that special dangers exist by electrical tensions for the life and the health of persons.



Danger of injury by floating load!



Use light respiratory protection.

---

### 5.2 Requirements for the staff, diligence

---



Only persons, who are entitled by training or qualification, may work on the plant. The persons must be assigned from the operator.



The safety regarding the protection of the product to be processed greatly depends on the behaviour of the persons working in the clean-air space and the system design.

---

### 5.3 Starting up

---



Read instructions before operating! Comply with instructions and keep manual close by!

Prior to connection to power, the connection values must be compared to the technical specifications! (see chapter „Technical specifications“)

Valid national laws, regulations and guidelines for the installation and operation must be adhered to.

---

### 5.4 Working with the clean-air unit

---



Work room illumination (when available) must be turned on for work.

Handling of gases or agents producing flammable steam in connection with air or causing an explosive atmosphere is prohibited.

Caution! Skin and eye injury! Don't look in the UV light! It's not permitted to work at the clean-air unit, when UV light is turned on

---

**5.5 Testing and maintenance**

---



The function and safety of the clean-air unit is only warranted if the necessary tests, maintenance, and repairs are performed.



Only qualified electricians may perform work on the electrical parts!



Mechanical or electrical work on the machine may only be performed under safe conditions (turned off). To completely disconnect from all power, the main switch must be turned to the 0/OFF position! Protect unit from restart

---

**5.6 Disposal**

---



Use light respiratory protection for filter exchange.



Used filters must be packed immediately in suitable bags or containers, locked closely and marked accordingly.

---

**5.7 Operating instructions**

---



The operator (owner) must provide easy to understand written instructions based on these operating instructions in the employee's language for work to be performed on and with the clean-air unit.

---

**5.8 Equipment manual**

---



Keeping an equipment manual containing test reports, reports for maintenance, and repairs or changes of the installation location, is recommended.



Keep the equipment manual separate from the operating instructions. The appendix of these operating instructions contains suggestions for an equipment manual and can be removed if needed.

---

**6. TRANSPORT**

---



Injury hazard!

The clean-air unit may fall or tip!



Always wear protective shoes with steel caps!

Note the weight of the clean-air unit! Lift clean-air unit only as needed!



The clean-air unit can be lifted and transported with a forklift.

Observe weight of the clean-air unit (see chapter "Technical specifications").

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## **7. SETUP**

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Observe safety notes in chapter 4!

The nationally valid regulations apply to setup and installation.

---

### **7.1 Setup location**

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The setup location for the clean-air unit must be selected so that air flow in front of or on the clean-air unit is avoided (air conditioning system, doors, windows, etc.).

---

#### **7.1.1 Housing**

---



Injury Hazard! The clean-air unit may fall or tip!

- Move the clean-air unit into its desired position on the machine frame at site with a suitable lifting device. Observe weight of the clean-air unit (see chapter “Technical specifications”).
- Fix clean-air unit with machine frame properly.
- Use silicone to seal the joints.

---

#### **7.1.2 Installation of prefilters**

---

In case prefilters are not mounted:

- Clean mounting frame.
- Insert pre-filter.

---

### 7.1.3 Installation of HEPA-filters

---

In case HEPA-filters are not mounted:

- Remove revision cover from the upper side of the clean-air unit.
- Out-fold switchboard cabinet.
- Clean mounting frame.
- Install HEPA-filters at desired position in mounting frame and fasten with clamps.



To achieve proper pressure of the filter elements, turn the adjustment screw until the spring clip of the filter spring is in a level position or the spring clip touches. Resulting gripping power approximately 400 N / spring.



Make sure that the filter fleece is not damaged during installation of the filter.

- In-fold switchboard cabinet.
- Mount revision cover on the upper side of the clean-air unit.



After HEPA-filter installation the following tests must be performed:

- Gasket check and particle tests for the filters.
- Measuring of air velocity.

---

**8. INSTALLATION**

---



Caution! Hazardous! High Voltage!



Observe Safety Notes in Chapter 5!



Only qualified electricians may perform work on the electrical parts!



The clean-air unit is designed for permanent connection to 230 V / 50 Hz.



Prior to connection to power, the connection values must be compared to the technical specifications! (see Chapter "Technical Specifications")



The main switch warrants disconnection from all power.

---

## **9. TESTS**

---



Installations, tests, maintenance, repairs and changing of location should be documented in the equipment manual. The user should keep the equipment manual separate from the operating instructions.

---

### **9.1 Tests with first start up**

---

---

#### **9.1.1 General control**

---

- Electrical safety check
- Check of operating elements
- Alarm check
- Illumination check
- Check of motor sound

---

#### **9.1.2 Tests according to DIN EN ISO 14644-3**

---

- Measuring of air speed to proof moderateness of air speed
- Integrity test of filters
- Proof of purity class of air

---

### **9.2 Recurring tests**

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---

#### **9.2.1 General control**

---

- Electrical safety check
- Check of operating elements
- Alarm check
- Check of motor sound

---

#### **9.2.2 Tests according to DIN EN ISO 14644-3**

---

- Measuring of air velocity
- Integrity test of filters



---

## 10. OPERATION

---



Observe safety notes in chapter 5!



The clean-air unit was designed for long-term operation to protect it from contamination.

---

### 10.1 Operating and display elements

---

The clean-air unit is operated by operating elements above the working space.

---

### 10.2 Operating elements

---

- **Main switch**
- **Illuminated key „Unit on/off“:**

The clean-air unit is turned on or off. With the clean-air unit started the key is illuminated.
- **Potentiometer**

Control of air speed by control of fan speed.
- **Illuminated key „Illumination“:**

Illumination is turned on or off.
- **Illuminated key „UV light“:**

UV light is turned on or off. Illumination and UV light are locked. To turn on UV light, illumination has to be turned off.

UV light needs external release.

---

### 10.3 Display elements

---

- **Yellow lights**
  - Pre-filter change
  - HEPA-filter change

---

**10.4 Turning on the clean-air unit**

---

Turning on only at first start up or after repair work:

- Turn main switch in position I/On
- Press illuminated key „Unit on/off“.



The clean-air unit is ready for operation after approximately 10 minutes.

Turning on for normal operation:

- Press illuminated key „Unit on/off“.



The clean-air unit is ready for operation after approximately 10 minutes.

---

**10.5 Turning off the clean-air unit**

---

Turning off the clean-air unit:

- Press Illuminated key „Unit on/off“.



Mechanical or electrical work on the machine may only be performed under safe conditions (turned off). To disconnect all power: Turn main switch to position 0/Off and/or unplug from supply! Protect clean-air unit from restart!

---

**10.6 Switching on/off illumination**

---

Switching on/off illumination:

- Press Illuminated key „Illumination“.



The illumination can be switched on/off independently of the operation of the clean-air unit.

---

**10.7 Switching on/off UV light**

---

Switching on/off UV light:

- Press Illuminated key „UV light“.



UV light can be switched on with the key „UV light“, when illumination is switched off.

UV light can be switched off by key „UV light“.

UV light can be switched off too by switching illumination on.



Observe safety notes in chapter 5!

Caution! Skin and eye injury! Don't look in the UV light! It's not permitted to work at the clean-air unit, when UV light is turned on



UV light needs an external release. This release is given to a 2-pole plug, when all connected protection covers at side are closed.

---

**10.8 Adjusting or readjusting of air speed**

---

Depending upon announcement of an external air speed measuring instrument, whose probe is placed in the air, the potentiometer has to be turned, until the desired value of air speed is reached.



If it is not possible, to reach the desired air volume or air speed by turning the potentiometer, the HEPA-filters have to be changed (see chapter „Cleaning and Maintenance“).

## 11. TROUBLESHOOTING



Observe safety notes in chapter 5!

Troubleshooting may only be performed by authorized trained personnel.

### 11.1 Malfunction sources

- Ventilator defective.
- HEPA-filter must be replaced.

### 11.2 Malfunction messages

#### 11.2.1 „Pe-filter change“

| Malfunction source                                  | Remedy   |
|---|--|
| Pre-filter is clogged, maximum pressure is reached. | Replace pre-filter (see chapter „Cleaning and Maintenance“). |

#### 11.3 „HEPA-Filter change“

| Malfunction source                                   | Remedy  |
|--|---|
| HEPA-filter is clogged, maximum pressure is reached. | Replace HEPA-filter (see chapter „Cleaning and Maintenance“) or call service to replace HEPA-filters. |

## 12. CLEANING AND MAINTENANCE

### 12.1 Cleaning



Observe safety notes in chapter 5!

Do not use aggressive or explosive disinfecting agents or abrasive cleaners!  
If necessary clean and disinfect housing and workspace (for example with mild soapy water).

- Cleaning (daily)  
Clean and disinfect workspace as needed.
- Cleaning (weekly)  
Clean exterior surfaces of the system (for example, with mild soapy water).

### 12.2 Maintenance schedule

The following maintenance must be performed in due time. It is necessary to assure safe operation without malfunctions of the system..

| Maintenance                                      | Maintenance interval  |
|--|---|
| Checking of air speed                            | every 6 month   |
| <b>HEPA-filter</b>                               |   |
| Seal seat check                                  | annually  |
| Particle check                                   | annually  |
| Replacement                                      | When message „HEPA-filter change“ appears or after approximately 4-5 years. |
| <b>Pre-filter</b>                                |   |
| Replacement                                      | When message „Pre-filter change“ appears.                                   |
| <b>Electrical components</b>                     |   |
| Visual check for defective electrical components | weekly  |
| Test settings (limiting and target values)       | annually  |
| <b>Housing</b>                                   |   |
| Visual check for external damage                 | daily   |
| Cleaning of the work area                        | daily   |
| Checking joints (clean-air unit / machine frame) | every 6 month   |

The life span of the HEPA-filters depends on operating conditions, environment, and the required degree of cleanliness of the sterile space.

Intervals refer to long-term operation (8 hours per day).

The above listed intervals are recommended values. The operator must adjust the period of time to suit local conditions, regulations and operation.

---

**12.3 Pre-filter change**

---



Only authorized personnel may replace the pre-filters.



Only original parts approved by the manufacturer may be used.

- Remove pre-filter and dispose of properly.
- Clean mounting frame.
- Insert new pre-filter.

---

**12.4 HEPA-filter change**

---

The life span of the HEPA-filters depends on operating conditions, environment, and the required degree of cleanliness of the sterile space. Based on experience, the operating life will be about 4 - 5 years.



HEPA filters cannot be regenerated!

Only authorized personnel may replace the HEPA-filter.



Only original parts approved by the manufacturer may be used.

- Make sure that the filter can be exchanged safely. Decontaminate the system and filters, if needed.



Put on protective clothing and protective mask with a suitable filter.

- Turn system off and disconnect voltage with main switch and protect from restart.
- Remove revision cover on the upper side of the clean-air unit.
- Out-fold switchboard cabinet
- Loosen filter clamps on the filter.



Filters are stretched downwards!

- Pull out clogged HEPA-filter carefully upwards.
- Used and contaminated filters must be packaged immediately in suitable bags or containers, closed tightly and marked as "Waste"!
- Clean mounting frame.
- Install new HEPA-filters at desired position in mounting frame and fasten with clamps.



To achieve proper pressure of the filter elements, turn the adjustment screw until the spring clip of the filter spring is in a level position or the spring clip touches. Resulting gripping power approximately 400 N / spring.



Make sure that the filter fleece is not damaged during installation of the new filter

- In-fold switchboard cabinet.
- Mount revision cover on the upper side of the clean-air unit.
- Turn on clean-air unit.
- Check air speed and adjust as needed.
- Perform seal seat and particle checks for the filters.



After HEPA-filter change the following tests must be performed:

- Gasket check and particle tests for the filters.
- Measuring of air velocity.

## 12.5 Exchanging fluorescent tubes



Danger due to electrical power or voltage!



Only qualified electricians may perform work on the electrical parts!

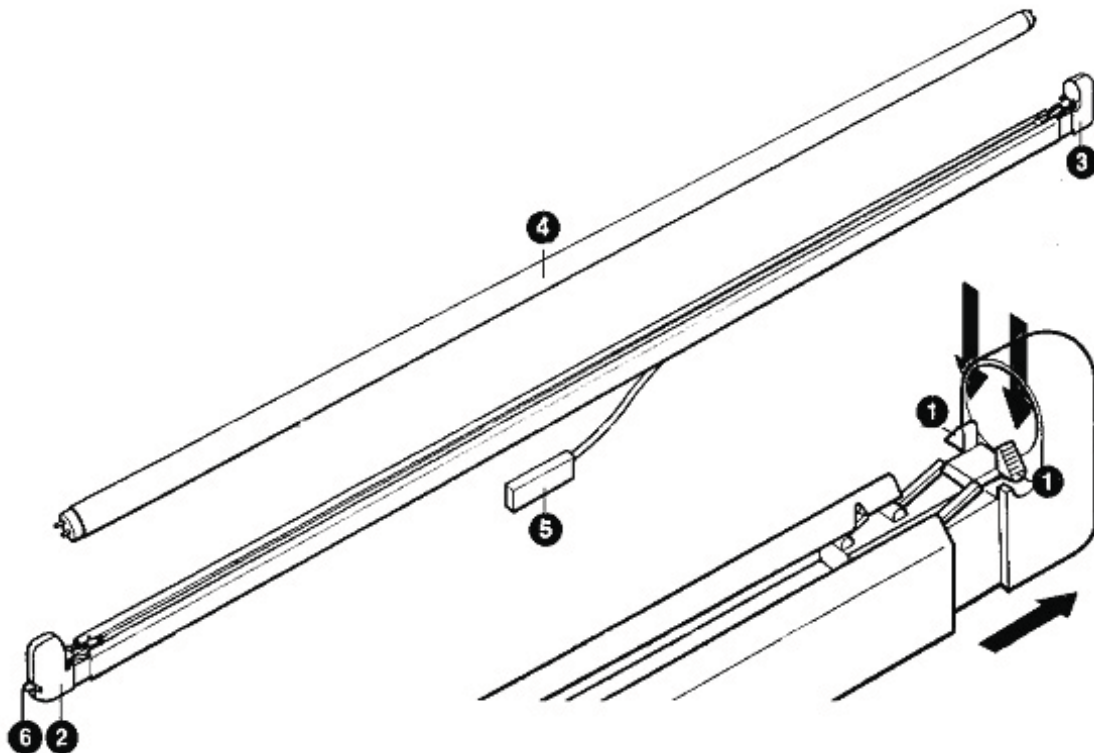
Only original parts approved by the manufacturer may be used.



Prior to performing work on mechanical or electrical parts, changes, maintenance, repair, and other work: To disconnect all power: Turn main switch to 0/Off position and/or unplug from supply! Protect unit from restart!

Tubes are hot - let cool before replacing!

- Disconnect clean-air unit completely from supply and protect from restart.
- Press (1) keys.
- Pull out sockets (2) and (3) and remove lamp (4).
- Install new lamp (4) and push the two sockets (2) and (3) toward each other until they snap together.
- Turn system on.





---

**13. CUSTOMER SERVICE**

---




Please contact the manufacturer with questions about customer service, parts, malfunctions, repair or warranty claims.

**BDK**  
**Luft- und Reinraumtechnik GmbH**  
**Pfullinger Straße 57**  
**D-72820 Sonnenbühl-Genkingen**  
Phone: +49 (0) 71 28 / 92 67-0  
Fax: +49 (0) 71 28 / 92 67-22  
Web: [www.bdk-online.de](http://www.bdk-online.de)  
E-mail: [bdk-s@t-online.de](mailto:bdk-s@t-online.de)

Always indicate the model and the serial number listed on the Identity plate.

## 14. IDENTITY PLATE

|  |  |
|--|--|
| Gerätetyp:   | <b>FFM 05.19</b>                             |
| Serien-Nr.:  | <b>927009</b>                                |
| HEPA-Filter:   | <b>MD14-2G10- ... -01PU</b>                  |
| H14 Zuluft   | <b>1x 610x305x66</b><br><b>2x 457x305x66</b> |
| Vorfilter:   | <b>F-20</b>                                  |
| G4   | <b>2x 387x267x20</b>                         |
| max. Leistung:   | <b>386 W</b>                                 |
| El. Anschluss:   | <b>230 V / 50 Hz</b>                         |
| Absicherung:   | <b>16 A bauseits</b>                         |
| Beleuchtung:   | <b>58 W</b>                                  |
| UV-Licht:  | <b>30 W</b>                                  |
| Baujahr:   | <b>08/2009</b>                               |
| <b>BDK</b> Luft- und Reinraumtechnik GmbH<br>Pfullinger Straße 57<br>D-72820 Sonnenbühl-Genkingen<br>Telefon: (0 71 28) 92 67-0<br>Telefax: (0 71 28) 92 67-22 |  |
|   |  |

## 15. TECHNICAL SPECIFICATION

### 15.1 Dimensions and weight

|                             |                  | Dim. |
|-----------------------------|------------------|------|
| Housing outside (W x L x H) | 2045 x 500 x 300 | mm   |
| Clean area (W x L x H)      | 2045 x 500       | mm   |
| Weight                      | approx. 120      | kg   |

### 15.2 Electrical components

|                          |            | Dim. |
|--------------------------|------------|------|
| Nominal voltage          | 230        | V    |
| Nominal frequency        | 50         | Hz   |
| Rated current            | 3,0        | A    |
| Nominal power            | 386        | W    |
| Fuse protection (supply) | at site 16 | A    |
| Illumination             | 58         | W    |
| UV light                 | 30         | W    |

### 15.3 Ventilation

|                   |      | Dim. |
|-------------------|------|------|
| <b>Air volume</b> |      |      |
| Layout            | 870  | m³/h |
| Normal operation  | 870  | m³/h |
| <b>Air speed</b>  |      |      |
| Layout            | 0.45 | m/s  |
| Normal operation  | 0.45 | m/s  |

### 15.4 Filter specifications

|                                |   |                | Dim.       |
|--------------------------------|---|----------------|------------|
| <b>Pre-filter</b>              |   |                |            |
| 2                              | Pre-filter Kalthoff F-20                | 387 x 267 x 20 | mm         |
| Separation grade [ASHARE] dust |   | A <sub>m</sub> | ≥ 90 %     |
| Filter class                   |   | DIN EN 779     | G4         |
| <b>HEPA-filter</b>             |   |                |            |
| 1                              | HEPA-filter Camfil MD14-2G10- ... -01PU | 610 x 305 x 66 | mm         |
| 2                              | HEPA-filter Camfil MD14-2G10- ... -01PU | 457 x 305 x 66 | mm         |
| Separation grade               |   | MPPS*          | ≥ 99.995 % |
| Filter class                   |   | DIN EN 1822    | H14        |

\* MPPS = Most Penetrating Particle Size

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**15.5 Materials**

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| System part | Individual component | Material               |
|-------------|----------------------|------------------------|
| LF module   | Housing              | Coated steel, RAL 7011 |

## 16. WASTE REMOVAL



The operator must provide measures to limit the resulting of waste, especially through promotion of clean technologies and recyclable products!

The operator is responsible for proper disposal or recycling of waste!

Specifically, the following rules in accordance with the EC Guidelines "Waste Removal" must be adhered to:

### **EC guideline „Waste removal“ 91/689/EEC:**

Article 1 to 12

Appendix I

Appendix I B

Appendix II

Appendix III

### **EC guideline "Restriction of the use of certain dangerous materials in electrical and electronics devices" 2002/95/EC**

Article 1 to 11

Appendix

### **EC guideline of "Electrical and electronics old devices" 2002/96/EC**

Article 1 to 19

Appendix IA

Appendix IB

Appendix II

Appendix III

Appendix IV

Items must be separated properly when removing the waste for this product!

**Materials:** for example metals, non-metals, composite materials, supplies and filters

**Electronic waste:** for example transformers, boards; cables

The national and regional waste removal regulations must be adhered to!

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**17. WARRANTY, LIABILITY FOR COMPLAINTS**

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**17.1 Warranty period**

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The warranty period is 24 months. It begins when the order is shipped.

The warranty will expire prematurely if the buyer or a third party perform unauthorized modifications or repairs or if the buyer, in the event of a problem, did not take the appropriate steps to reduce the damage or does not give the supplier a chance to correct the problem.

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**17.2 Liability for faulty materials, construction and design**

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We will, upon written request by the buyer, replace or repair all parts that are proven to be damaged or unusable due to poor material, incorrect construction or insufficient manufacture up until the warranty expires. Replaced parts become our property and must be returned directly to us or to one of our representatives immediately and free of charge.

Warranty Exclusions:

Any damage resulting from normal wear and tear, insufficient maintenance, non-compliance with operating instructions, excessive use, unsuitable operating means, chemical and electrolytic influences or modifications, or installations not performed by us are excluded from this warranty.

Also, we are not obligated to honour the warranty if the buyer does not meet his payment obligations as agreed.

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**17.3 Exclusion of warranty claims**

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Excluded from the warranty are any claims of the buyer for direct or indirect losses.

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**17.4 Deliveries and services provided by sub-suppliers**

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For deliveries and services performed by sub-suppliers determined by the buyer, the supplier is only liable within the general warranty obligations of the corresponding sub-supplier.



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## **APPENDIX LISTING**

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**APPENDIX A - EC Conformity declaration**

**APPENDIX B - Protocols / certificates**

**APPENDIX C - Drawings**

**APPENDIX D - Circuit diagram**

**APPENDIX E - Spare parts**

**APPENDIX F - Data sheets**

**APPENDIX G - Equipment manual**